

Android Controlled Fire Fighting Robot

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Abstract— Fire Fighting Robot is necessary for any fire incidents in our society because it is able to protect our precious life from the danger so we proposed firefighting robot by using of Arduino UNO microcontroller and included Bluetooth module in it for the fire alert to the controller, flame sensor or smog sensor is used to sense fire or smog, submersible pump and its module is used to eject water from the water cane, At last we implement it on the robot chassis of four wheels and for its movements we just install a BO motor that move it into one to another point of flame and helps robot to move and connect it through the wires. This is the modern and technical solution to solve the problem of protecting life in industries, houses, power plants and in transport vehicles like in cars, trucks and busses also. Fire men always keep their life in danger for saving lives of that peoples that are in danger. This is a basic model to protect them from fire incidents, thus we are trying to give the solution of above given problems.

Keywords— Arduino UNO, Flame sensor, Motor Driver module, Mini DC Submersible Pump, Breadboard, Robot chassis.

1. INTRODUCTION

Life is an important aspect in any parameter, no matters it is a life of any human or animal and fire disaster is a major reason of losing lives and most common reason of losing lives in fire incident is trying to protect someone. Initially, robot detects the fire or smog from the environment and then starts reacting according to the command that is given by the Arduino UNO that is already stored in C programming language. It goes in front of fire incident and then the water tank is ejecting water by the DC mini submersible pump [1]. For such fire incidents, fire fighting robot is necessary for our society it can remove the danger on the fire fighters. Nowadays robots are commonly used for our betterments in daily life. In a particular area fire extinguisher robot is sense the flame and then move in the direction of flame it detects the fire location. In this robot Arduino UNO is used as microcontroller the programming of the robot is done using the Arduino C which is derived from C language. That is basically used for giving a particular command to the submersible pump to eject the water from the pump [2]. We can also

implement a camera and control it manually but because of smoke camera is not good in that type of circumstances so that we used only flame sensor for the input of fire incidents. Sometimes it is impossible to protect someone by fire fighters because of smoke and high temperature and some innocents must lose the life [3]. Fire extinguisher is on when it detects the fire and ejects the water from its water tank by the Pump because of this type of robot he can protect people without getting any harm to the fire fighter [4]. Robot is a mechanical device that is used for high-risk task like as firefighting. Some of the surfaces that is sandy or rough there the use of robot must be in the form of tank. In process of flame detection, it is possible that robot cannot enter the room because of various door locations and stuck in any of the place. Algorithm has a main role to solve this problem. Besides equipped with sensors that have different functions and specifications, algorithm for robot navigation is also needed [5]. An Android application that is connected to the Bluetooth module is developed to control the robot is explained [6]. Component resistance at different temperature and it can extend it at 1200. [7] RF remote signal is used to control the device [8]. Fire fighting in home-based technology is explained. [9] Fire detection with infrared sensor. [10] CO2 in the in the place of water because of its compressibility [12]. Focussing on the factors that are basically for not affect the ecosystem majorly [13]. Nonholonomic systems [14] different methods of robot operating system [15]. Feasible command strategies. [16] Architecture of mobile robot [17]. Nowadays we are moving on the era of technology there are humans and robots co-exist [18]. Robot can provide us live video and live location [19]. Software architecture Arduino UNO programming mostly in C language [20][21]. Fire management system of ATM [22]. The UAV designed is used for sowing seeds are taken as a reference [23]. The device controlling algorithms and image processing algorithms that is used to detect the Fire [24].

2. FUTURE VISION

This project is aiming for lots of future vision, one can use GPS in the robot to know the exact location information of the ROBOT in the fire area, so that the robot can be controlled Accurately by the controller through the android device. The GPS based system will give some additional information about the severity of the fire or the area affected by the fire in the location. An SOS can be sent by the ROBOT to the nearest emergency services to act on them accordingly.

CO₂ Cylinders can be used in place of the water tank, as the CO₂ takes less space, and it can make the Robot to fight the fire for longer interval of the time. Using CO₂ means most effective way of the extinguishing of fire. The same sensor can activate the CO₂ cylinders to spray on the fire affected area. A tank chassis can also be used instead of the normal 4 wheel. Using the tank chassis means the Robot can cover severe area, which have rough surfaces where the 4 wheels can occur problems in the rough surfaces where a robust and strong chassis is needed.

The Robot can also be equipped with the high-resolution camera, whose output can be displayed on the same android device by which it is being controlled by the controller. The camera can give actual footage of the fire affected area. By taking feedback from the camera, this smart robot can extinguish fire by rotating the sensor to all the four sides using the android device.

This robot can also be equipped with the fire proofing material with the higher IP (Ingress Protection) rating. Which means even if the robot enters the fire scene it can protect itself from the fire. The fireproofing will prevent the robot from the severe fire and give it some extra ability to enter the fire scene and starts diminishing the fire.

In section 1 trying to understand by the reference of existing proposals, their thoughts and visions, section 2 is about our proposed robot that we are proposing as our project, section 3 hardware, and the software implementation of this robot and at last section 4 we are concluding the proposed paper.

3. EXITING SCHEMS

In this world of Enovation experts are working on those thing that is possibly invented by them some existing robot that we are referring for this robot is like that: the robotic vehicle is equipped with water tank, and a pump that is operated by wireless communication home based fir fighting robot means a robot that is used for fire extinguishing specially in home shown in figure 1(a) because that fire accidents is mostly happens in industries and secondly in houses and the whole family have to face high risk of burning from fire. Robots detects the fire with the help of an Arduino it reacts and goes near to the fire incidents then eject water by the pump from the container that we are using to contain water [3].

In figure 1(b) a robot tank that is used to fire extinguishing on that place there is sandy ore rough surface. LM35 sensor for temperature detecting flame or smog sensors to detect fire and a water cane of 1 litre capacity which is made up of a string and hard cardboard that makes it water and fire resistant the robot has four wheels but two wheels for its movement that is connected to the battery-operated dc motor for its movement [5]. A Bluetooth module used to send the working notification to the user using that Bluetooth module. DC geared motor is used to control the speed of the motor that is used to rotate the robot chassis. Product that we are using is must have to be ecofriendly because we are trying to make a product that is for fire extinguishing that is already very painful for the ecosystem [8].



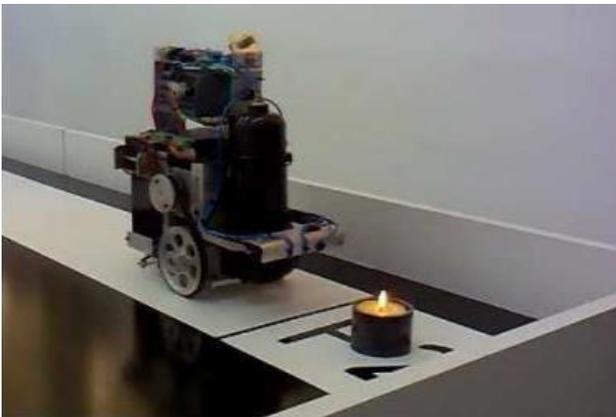
(a)

In figure 1(c) Robot uses CO₂ in the place of water because it is more compressible and less area required to contain it. Robot uses camera for the understanding of the exact situation of the burning location where eyes are not able to see something camera is used and smog sensor is used to detect the fire and smog that is easy in fire extinguishing [12].



(b)

Using GSM to detect the information and send it to the desired cell phone by in the form of SOS using RF interface and Internet [13].



(c)

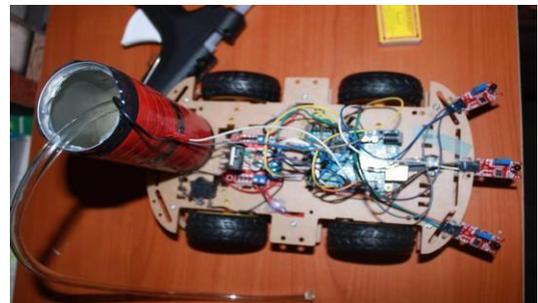
Fig. 1 (a) Home Based Fire Fighting Robot [3] (b) Fire Fighting Tank [5] (c) Firefighting robot with co₂ container [12]

4. PROPOSED WORK

Android Controlled firefighting robot, the robot proposed here has a simple vision of saving fire fighters from the area where they can get injured while saving the precious lives of the people. This robot is equipped with the HC-05 Bluetooth Module which makes it to interact with the android smartphone. There is an application which interfaces with the HC-05 Bluetooth module and once the connection gets established then the battery-operated dc motors will start the movement of the ROBOT using the command received from the application via the Bluetooth module. The moment robot sees a fire with its three flame sensors equipped in the front side of the robot, it activates the PUMP to start the water spray over the fire affected area. The brain of the robot is the Arduino UNO microcontroller. All the inputs and output of the sensors and other equipment's is controlled by this microcontroller by the program uploaded on it by using the IDE of Arduino.cc. The programming language used to control the robot is C programming language. As the output of the micro controller is not enough to control the PUMP, a relay module is used to switch on the pump by receiving the HIGH input from the microcontroller.



(a)



(b)

Fig. 2 (a) Actual firefighting robot (b) Wiring of the Robot

In figure 2(a) The actual firefighting robot picture is attached. This how the proposed robot looks from the TOP view. An insulating Material is placed above the wiring of the robot to protect it from the water damage in case of any tripping and pipe damage or a malfunctioning of the Tank. In figure 2(b) the wiring of the robot is shown including the essentials materials like Relay module, L298 motor driver, three flame sensors, lightweight but strong chassis, A long tank with good volume of water and all these things is connected with the brain of the robot, the Arduino UNO with the wires attached.

4.1 HARDWARE IMPLEMENTATION

Hardware implementation is one of the important parts in the development of fire fighting robot. In figure 2 includes Arduino UNO, IR flame sensors, Mini DC submersible pump, motor driver, mini breadboard, connecting wire, and rubber wheels. That consists of a IR flame sensors as the input of the system. Arduino UNO is used as a micro-controller that connects other components. L293D Motor driver is used to drive motors and can run two DC motors (Right DC motor and Left DC motor) at the same time.

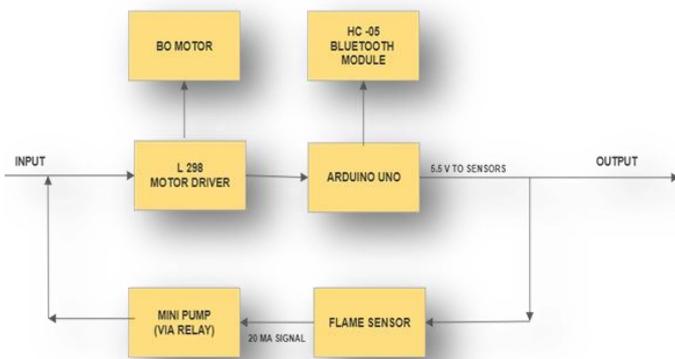


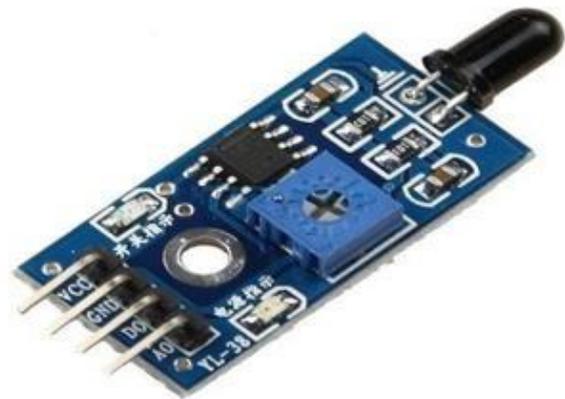
Fig. 3. Block diagram of Fire Fighting Robot

Arduino UNO is an open-source microcontroller board has 14 pins in it. The Arduino UNO Micro-controller board is based on the ATmega328P IC.

In figure 4(a) Arduino UNO used in all types of robotic applications. It is basically used to control all the components in this robot. In figure 4(b) fire sensor or Flame sensor robot contains basically three flame sensors that are IR sensors. The Infrared flame sensor detects the flame or smog in the Environment. Module is infrared receiver basically and basically detects the presence of flammable and harmful gases likes' hydrogen, nitrogen, and carbon mono oxide. The signal detection capacity is adjustable. The robot contains three flame sensors. In figure 5(c) a DC submersible pump that is battery operated for the water ejection and a cane that is used to contain water for the pump. In figure 5(b) a L293D motor Driver module is used for the controlling of fire fighting robot like a remote-controlled car.



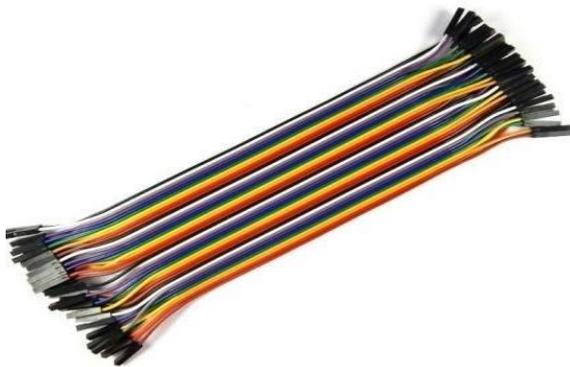
(a)



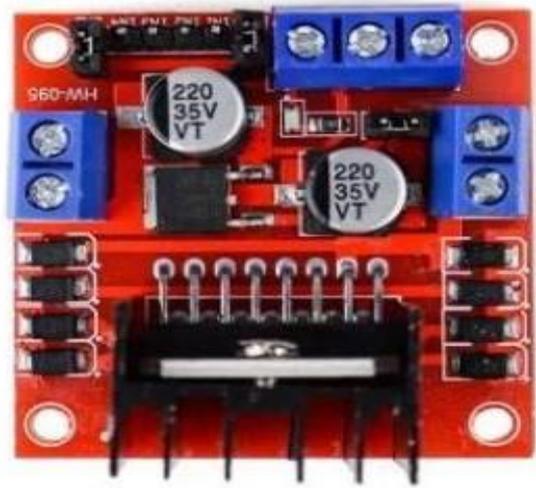
(b)

Fig. 4 (a) Arduino UNO (b) Flame sensor

Connecting wires is used to connect one point to other for the flow of current in the devices. These wires are mostly made up of copper or aluminum that is used commonly represented in figure 5(a). L293D motor Driver module receives signals from the microprocessor and transmits the relative signal to the motors, it is basically motor driver it contains 16 pins peak current is 1600 mA and operating Voltage is 4.5 to 12v. Shown in figure 5(b) in this module Motor Control Pin controls the rotation direction of motor it is able to drive two motors at a single time. In figure 5(c) Mini DC Submersible Pump is a centrifugal water pump, which means that it uses a motor to power an impeller that is designed to rotate and push water outwards, it uses direct current for the power source, it is basically a mini type of submersible pump of 3 to 6v. In front of Arduino this type of pump is comfortably in use. A submersible pump pushes water to the surface by converting rotary energy into kinetic energy into pressure energy.



(a)



(b)



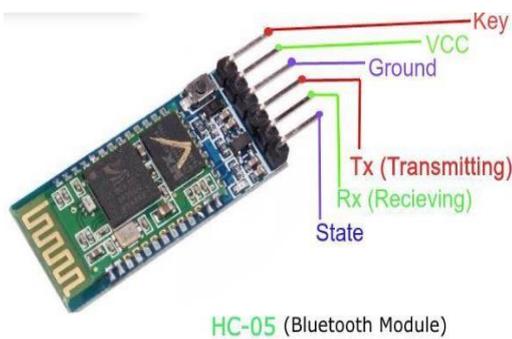
(c)

Fig. 5 (a) Connecting wire (b) L293D motor Driver module (c) Mini DC Submersible Pump

This is very capable in battery operator in lightweight robots. In figure 6(b) HC-05 Bluetooth Module that is a Bluetooth SPP (Serial Port Protocol) module. It needs 4-6v power supply; it has a range of 10 meters with the speed of 1 mbps. It has serial communication so that is easy in use with controller or PC. It is easy to connect and easy in handle and most preferable Bluetooth module in robot making.



(a)



HC-05 (Bluetooth Module)

(b)

Fig. 6 (a) DC BO Motor (b) HC-05 Bluetooth Module

4.2 SOFTWARE USED

Arduino IDE is the official software used for the programming of the Arduino micro controller, it is based on the programming language named processing which is also supports the C and C++ programming language. For upload it to the board Arduino IDE helps it to makes it easy. By using the Arduino IDE serial monitor function, Program accuracy can be checked too.

5. CONCLUSION

Android Controlled Fire Fighting Robot is successfully implemented that can remove the burden on the firefighters who faces life changing threats every day. It can be improved further in the area of removing water for the fire extinguishing because it is dependent on the volume and volume of water cannot be compressed. Our main vision was to save the lives of the fire fighters whose life are always at risk. This Robot is more than capable of that. The movement can be controlled by the Android Device which makes it compact and handy

and can be controlled by anyone, once trained. The fire sensors or the flame sensors are quick to sense any flames and respond to the microcontroller with that.

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